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(54) Fairing arrangement for aircraft

(57) An externally mounted fairing arrangement for bridging an aircraft fixed structure 10 e.g. a wing and a control surface 11, e.g. an aileron, hingedly mounted upon and angularly displaceable with respect to the fixed structure. The fairing arrangement 15 includes a single element sealing diaphragm 20 which maintains continuity of the fairing aerodynamic shape whilst permitting differential movement between the respective parts 16, 17 of the fairing 15. The sealing diaphragm may be of fabric material or a moulded plastics material such as nylon, and incorporates stabilising elements comprising grouped layers of flexible rods 25 in single or stacked layers.

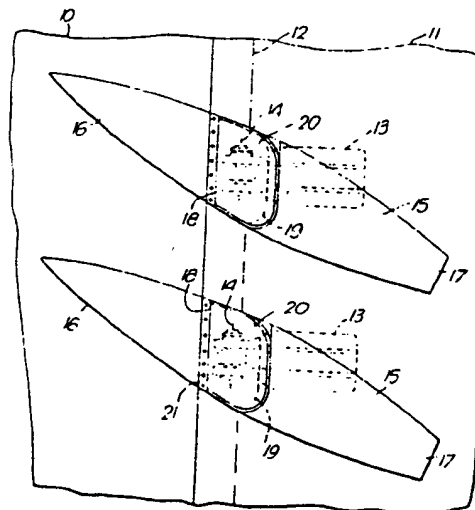


Fig. 1.

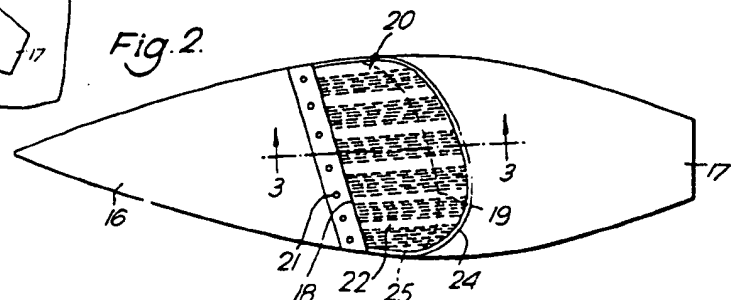


Fig. 2.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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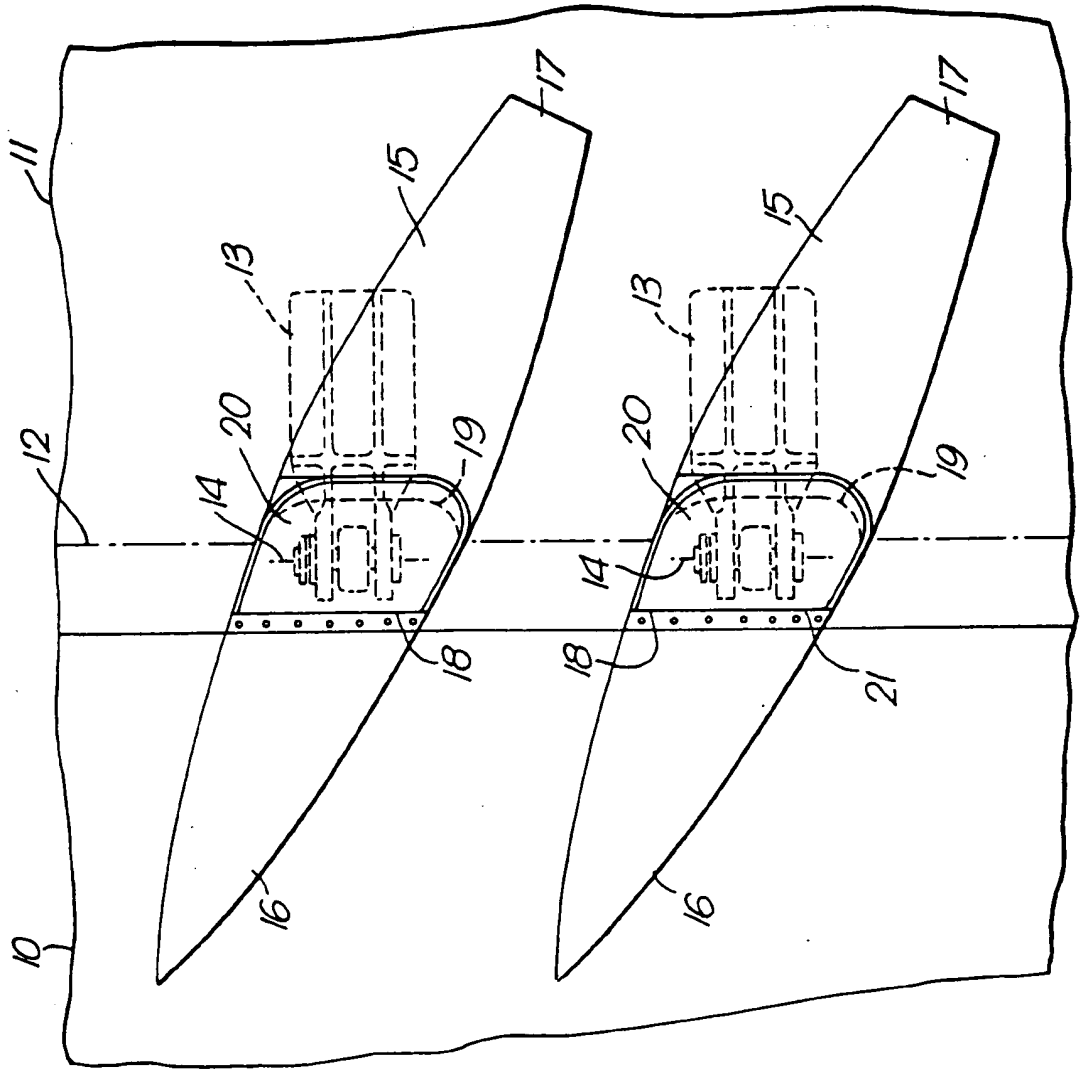


Fig. 1.

Fig. 2.

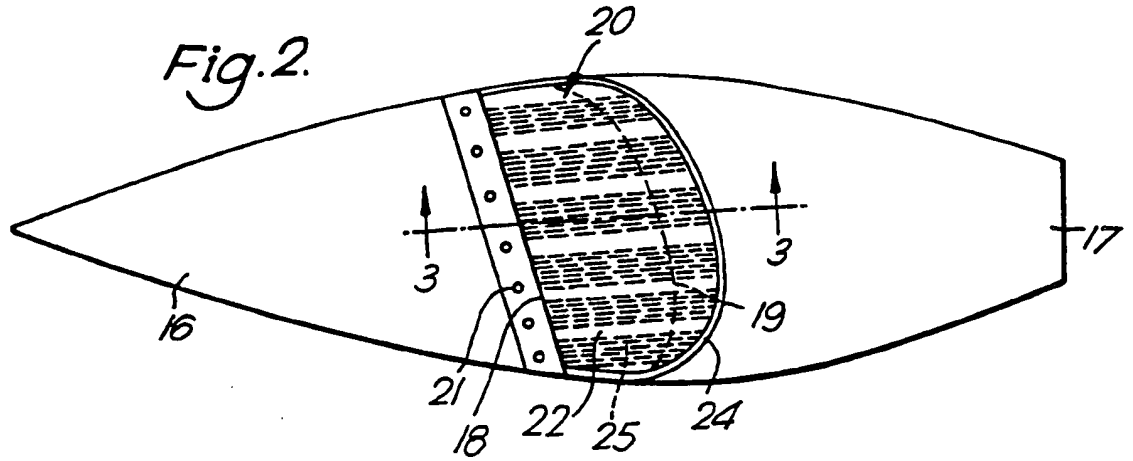


Fig. 3.

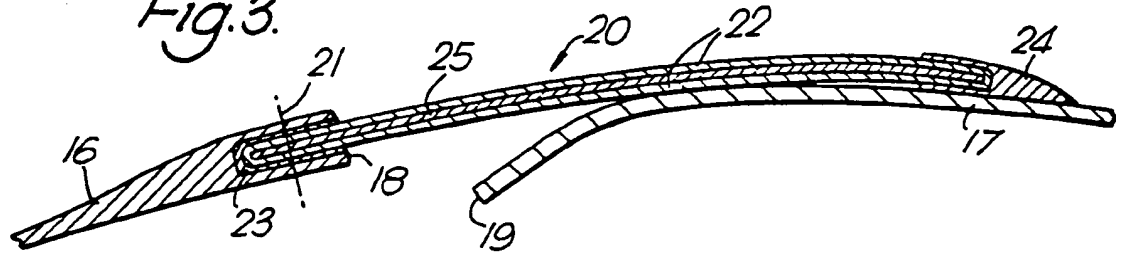
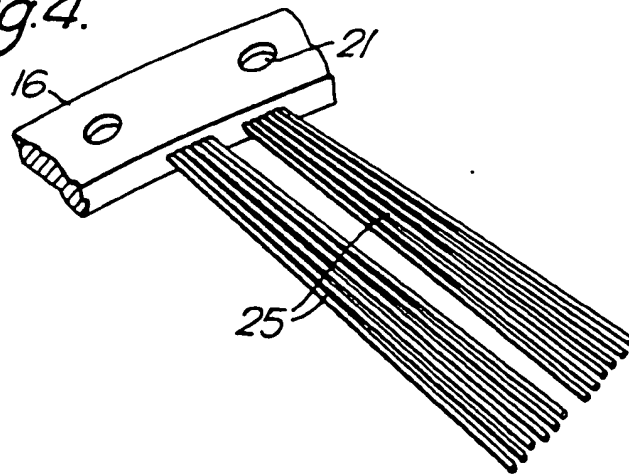
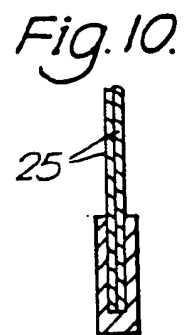
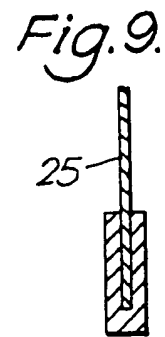
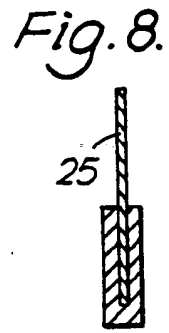
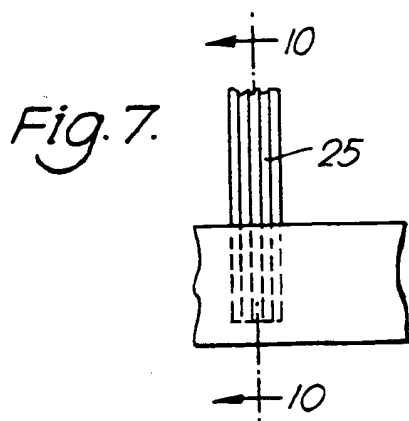
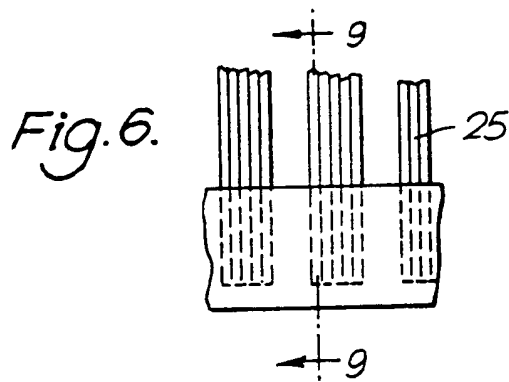
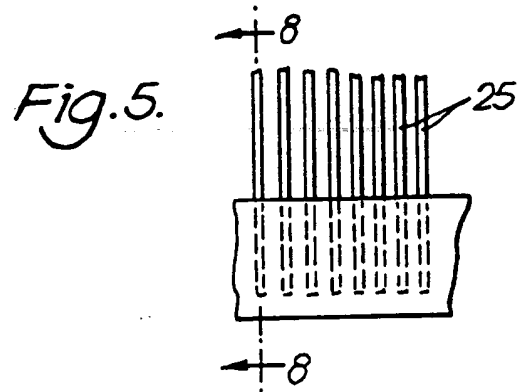


Fig. 4.





FAIRING ARRANGEMENTS FOR AIRCRAFT

This invention relates to fairing arrangements for aircraft. More particularly, though not exclusively, it relates to seal arrangements for use with externally mounted fairings associated with flying control surfaces, for example ailerons.

In our co-pending British Patent application, 9018423.5, we claim such an externally mounted fairing arrangement in which the fairing portions respectively fixed to the aircraft fixed structure and the control surface are bridged by an intermediate flexible sealing portion comprising a labyrinth seal of two or more overlapping or interconnected sealing elements which can accommodate differential movement between the fixed fairing portions when the control surface is angularly displaced relative to the aircraft fixed structure, i.e. the wing.

An alternative sealing arrangement is disclosed in our co-pending British Patent application 9020785.3, in which the intermediate flexible sealing portion comprises a single element sealing diaphragm which is deformable to accommodate the differential movement between the respective fairing portions. In the preferred arrangement, the diaphragm includes surface stabilising elements either stitched or moulded in-situ. These stabilising elements can be single flexible rods, for example of circular cross section, or of some other suitable cross-section.

According to the present invention there is provided an externally mounted fairing arrangement for mounting upon and bridging an aircraft fixed structure and a control surface hingedly mounted upon and angularly displaceable with respect to said aircraft fixed structure, said fairing arrangement including a first fairing portion located upon said fixed aircraft structure, a second fairing portion located upon said control surface and an intermediate flexible seal arrangement interconnecting and bridging the gap between said first and second fairing position, said flexible seal arrangement including a flexible single element sealing diaphragm configured to substantially conform to the cross-sections of said first and second fairing portions but deformable to accommodate differential movement between the fairing portions when said control surface is angularly displaced relative to said aircraft fixed structure while still maintaining a substantially smooth surface continuity, characterised in that said sealing diaphragm integrally includes grouped layers of flexible rods each of said grouped layers lying substantially parallel to but spaced apart from its adjacent layer or layers across the surface of the sealing diaphragm and in a substantially longitudinal direction.

The flexible rods may comprise a single layer of rods grouped together or more than one stacked layers. The sealing diaphragm may be of fabric, rubber or rubberised

fabric material to which or into which the flexible rods may be stitched or it may be of nylon or other suitable mouldable material and into which the flexible rod groups may be integrally moulded.

Embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings in which :-

Figure 1 illustrates, in plan view an external fairing assembly for an aircraft aileron installation.

Figure 2 illustrates, in plan view an external fairing assembly incorporating a flexible sealing arrangement in accordance with the present invention.

Figure 3 is a longitudinal cross-section through part of the external fairing assembly taken along a line '3 - 3' in Figure 2.

Figure 4 is a diagrammatical arrangement of a flexible seal showing one embodiment flexible rods in accordance with the invention.

Figures 5 to 7 inclusive illustrate alternative mounted groupings of flexible rods in accordance with the invention.

Figures 8, 9 and 10 are cross-sections through the groupings of flexible rods taken along lines 8 - 8, 9 - 9 and 10 - 10 in Figures 5, 6 and 7 respectively.

Referring to the drawings Figure 1 illustrates, in plan view, a trailing edge portion 10 of an aircraft wing and a portion of aileron 11 mounted at 12 to the wing by hinge

brackets (not shown). Twin lever brackets 13 mounted upon the aileron 11 providing pivotal attachment 14 for hydraulic jacks (not shown). The lever brackets 13 and the hydraulic jacks protrude somewhat outside the wing bottom profile and are consequently enclosed within fairing assemblies 15. It would be possible but less preferable to utilise a single all-encompassing fairing.

The fairing assemblies 15 are disposed in line of flight, that is chordwise with respect to the aircraft longitudinal centre line whereas the lever brackets 13 and the hydraulic jacks lie normal to wing.

Each fairing assembly 15 includes a forward fairing 16 and rearward fairings 17 having cut lines 18 and 19 respectively and an interconnecting flexible seal assembly 20.

With reference to Figures 2 and 3, the flexible seal assembly 20 is bolted at 21 to the forward fairing 16 and extends rearwardly to overlap and seat upon the rearward fairing 17.

The flexible seal assembly comprises a flexible diaphragm 22, which may be of suitable fabric material or of moulded plastic, for example, nylon, stabilised across its surface by groups of longitudinally disposed flexible rods 25 integrally stitched or moulded into the diaphragm depending on the material employed. The diaphragm 22, in conjunction with the bolts 21, as previously referred to, is



clamped within a retaining plate 23 along its forward edge 18 and incorporates a peripheral seal edge member 24 which stabilises the remainder of the diaphragm edge.

Various combinations and configurations of flexible rods may be employed for stabilising the diaphragm surface as illustrated by way of example in Figures 4 - 10 inclusive. In these figures, for reasons of clarity, the diaphragm 15 is omitted to more clearly show the rods. These may be in single layer groupings as shown in Figures 4 and 6, in single rod form as shown in Figure 5 where they are equally disposed laterally across the diaphragm surface or, as shown in Figure 7 and 10 they may comprise two or more stacked layers.

CLAIM

1. An externally mounted fairing arrangement for mounting upon and bridging an aircraft fixed structure and a control surface hingedly mounted upon and angularly displaceable with respect to said aircraft fixed structure, said fairing arrangement including a first fairing position located upon said fixed aircraft structure, a second fairing portion located upon said control surface and an intermediate flexible seal arrangement interconnecting and bridging the gap between said first and second fairing portion, said flexible seal arrangement including a flexible single element sealing diaphragm configured to conform to the cross-sections of said first and second fairing portions but deformable to accommodate differential movement between the fairing portions when said control surface is angularly displaced relative to said aircraft fixed structure while still maintaining a substantially smooth surface continuity characterised in that said sealing diaphragm integrally includes grouped layers of flexible rods each of said grouped layers lying substantially parallel to but spaced apart from its adjacent layer or layers across the surface of the sealing diaphragm and in a substantially longitudinal direction.

2. A fairing arrangement according to Claim 1 in which each of said grouped layers of flexible rods are in a single layer.

3. A fairing arrangement according to Claim 1 in which each of said grouped layers of flexible rods comprised two or more stacked layers.
4. A fairing arrangement as substantially described with reference to the accompanying drawings.

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